CASTILLEJA ALBOBARBATA SP. NOV. (OROBANCHACEAE) FROM SIERRAS MANANTLÁN AND CACOMA, JALISCO, MEXICO

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ABSTRACT

A new species, **Castilleja albobarbata** Iltis & Nesom, is described from localities in Sierra de Manantlán and Sierra Cacoma of Jalisco, México. It differs from *C. integrifolia* primarily in features of vestiture and is geographically disjunct from the nearest populations of *C. integrifolia* by about 450 kilometers.

KEY WORDS: *Castilleja*, Orobanchaceae, Scrophulariaceae, Sierra de Manantlán, Sierra Cacoma, Jalisco, México, biogeography, rare plants

RESUMEN

Se describe una especie nueva, **Castilleja albobarbata** Iltis & Nesom, de la Sierra de Manantlán y Sierra Cacoma de Jalisco, México. Se diferencia de *C. integrifolia* principalmente por las características del indumento y está separada geográficamente unos 450 kilómetros de la población más próxima de *C. integrifolia*.

Castilleja albobarbata Iltis & Nesom, sp. nov. (**Figs. 1–3**) TYPE: MÉXICO. JALISCO: Mpio. Cuautitlán, [Sierra de Manantlán Biosphere Reserve], top of sharp crest of the Sierra de Manantlán Oriental just E of Cerro Las Capillas, along highest point of gravel road from Cerro La Cumbre to Los Jardines, 19 km due SSE of El Chante (19° 33'19" N, 104° 09' W), cliffs of basaltic sandstone conglomerate, 2800–2860 m elev., 10 Oct 1980, *H.H. Iltis 3227 with R. Guzmán-M.* (HOLOTYPE: WIS; ISOTYPES: TEX, ZEA).

Castillejae integrifoliae L.f. similis sed vestimento trichomatibus brevissimis antrorse appressis et corollarum galea albobarbata differt.

Herbaceous perennials, usually with numerous (up to 15) erect to ascending or sprawling stems originating from the common base, the stems 2–4(–7) dm tall, basally woody, simple or few-branched in the upper half; stems, leaves, and bracts eglandular, moderately to sparsely invested with short (ca. 0.05–0.1 mm long), white, flattened, antrorsely ascending-appressed hairs. Leaves yellow-green, spreading to slightly deflexed, entire, not clasping or auriculate, those of the lower stems linear to narrowly lanceolate, 25–45 mm long, 2–4 mm wide,

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FIG. 1. Habit of *Castilleja albobarbata* (type collection).

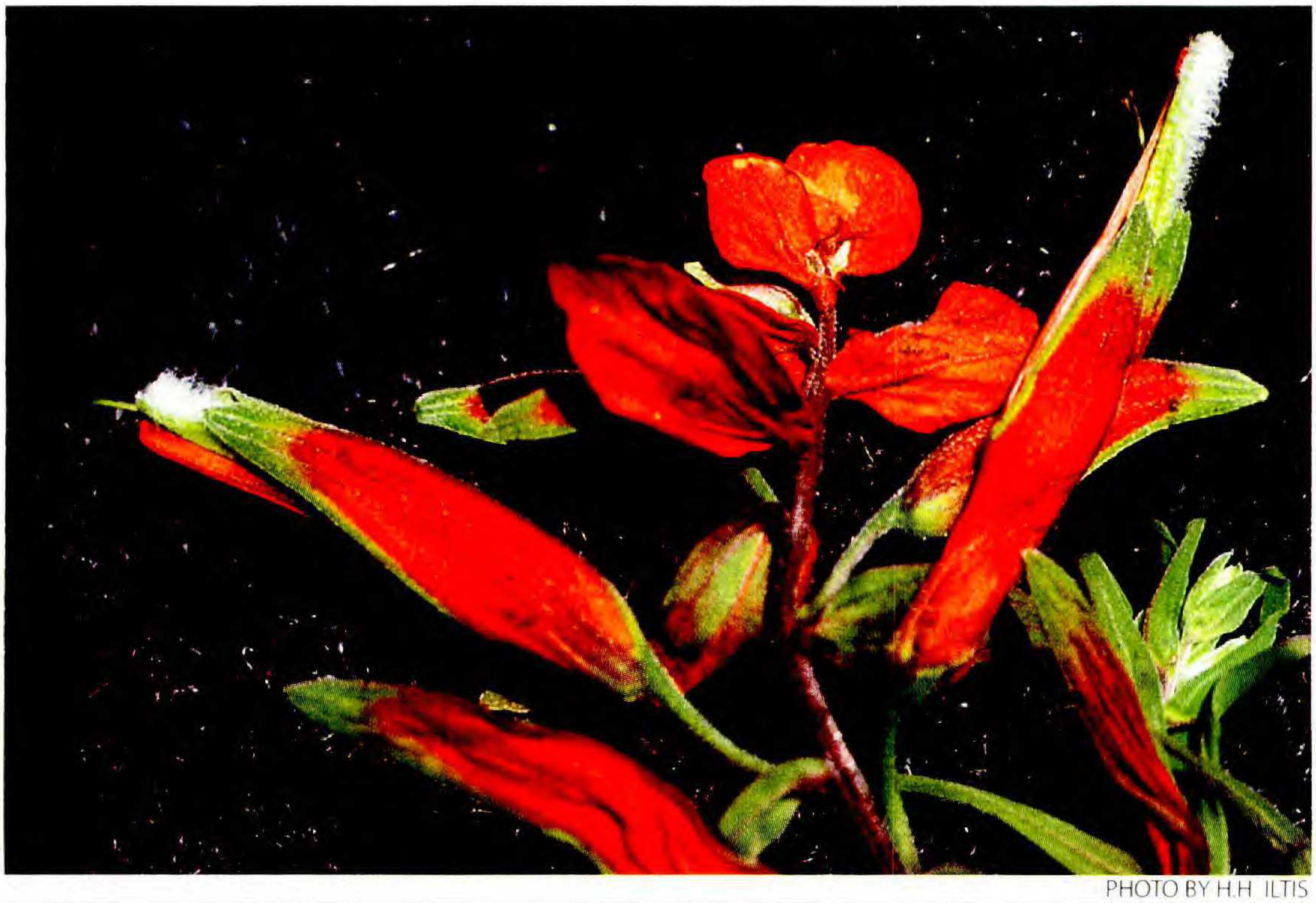

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FIG. 2. Flowers of *Castilleja albobarbata* (type collection).

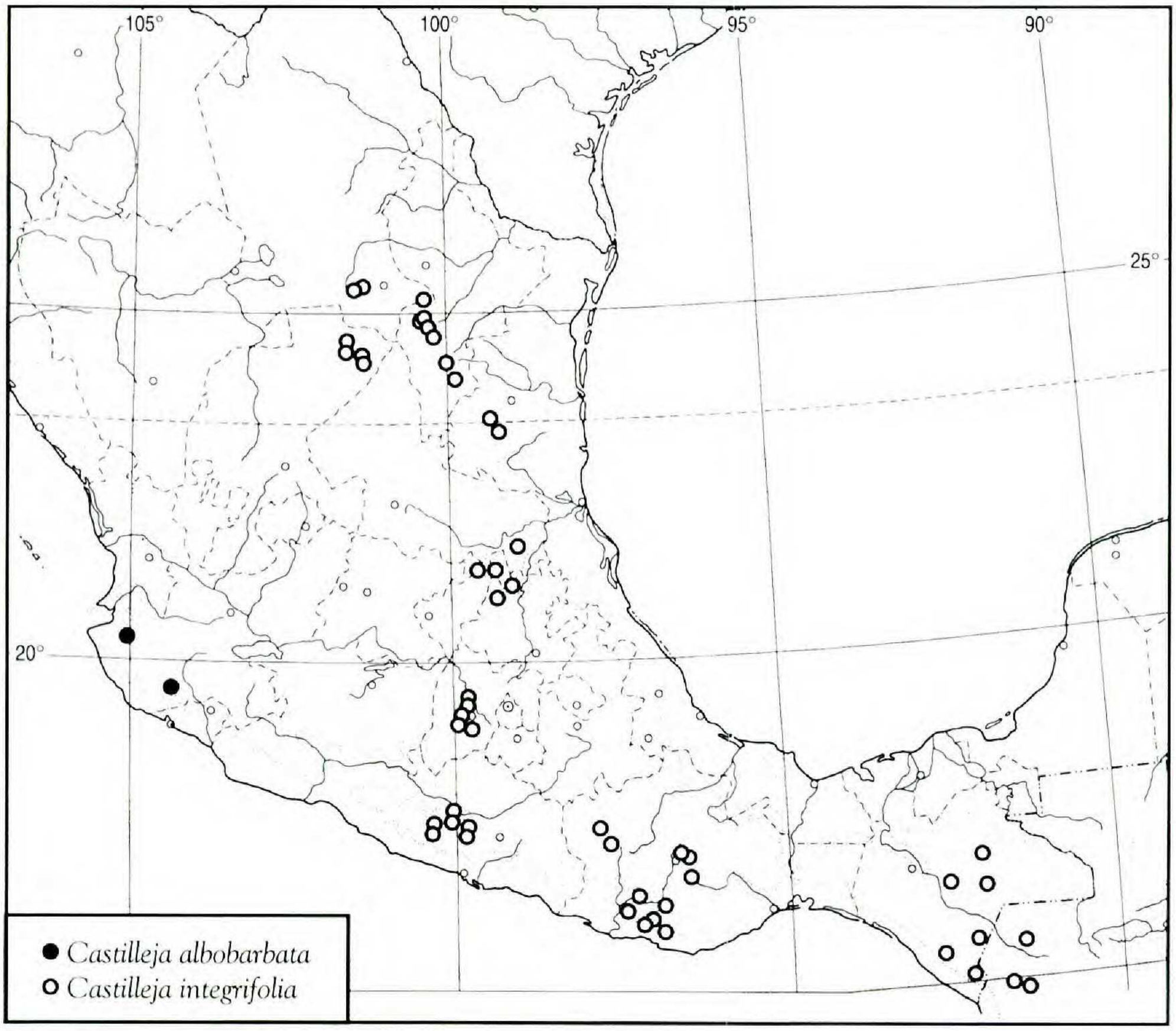

FIG. 3. Distributions of *Castilleja integrifolia* in Mexico and *C. albobarbata*. Modified after Nesom 1992.

becoming narrowly ovate-lanceolate near the inflorescence with a subclasping base and up to 6 mm wide, grading into the floral bracts. Floral bracts entire, lanceolate, 15–35 mm long, markedly enlarged from the uppermost leaves, the lower bracts completely green, the terminal persistent and conspicuous, markedly differentiated from the lower, red and obovate to widely ovate. Flowers in a racemose, somewhat secund inflorescence; pedicels 10–20 mm long, ascending; calyces 29–35 mm long, slightly gibbous abaxially, minutely hispid-strigose, brick-red with a yellow-green apical margin or sometimes yellow at the base, less commonly yellow-green throughout, the abaxial cleft 20–25 mm deep, the adaxial cleft 2–5 mm deep, the primary lobes with 2 short teeth or acute notches; corollas 40–45 mm long, the tube pale yellowish, becoming brick-red near the lower lip; the galea yellowish with red flanges, 25–27 mm long, 5/8–5/9 the length of the corolla, exserted (2–)7–15 mm from the calyx, producing a long (ca. 12 mm), densely pilose, adaxial, toothbrush-like beard of multicellular, white trichomes 2–3.5 mm long, the corolla otherwise glabrous, the lower lip composed of 3, small, thickened, greenish-yellow, incurved teeth 1–2 mm

long; stigma barely thickened, ca. 0.3 mm wide; anthers 2–2.5 mm long. Mature fruits not observed.

Additional collections examined: **MEXICO. Jalisco.** Mpio. Cuautitlán: Sierra de Manantlán, area of type collection near Cerro Las Capillas, pine woods with *Arbutus* and *Comarostaphylos*, 2800 m, 31 Aug 1986, *Cuevas 1617* (WIS) and 9 Jan 1980, *Iltis et al. 2507* (WIS, ZEA); Sierra de Manantlán, ca. 15 mi SSE of Autlán by way of Chante, rocky outcrops in cypress-pine forest, 8700 ft, 30 Jul 1949, *Wilbur and Wilbur 1989* (MICH, NY); Mpio. Cuautitlán: Sierra de Manantlán, rocky summit of canyon 3 mi W of El Guizar, 9300 ft [near type locality?], flowers red, white, and green, 23 Nov 1968, *Boutin and Brandt 2550* (MICH); Mpio. Talpa de Allende: [Sierra Cacoma], 4 km due SE of Cuale along dirt road between El Tuito turnoff (5 km N of El Tuito and 32.2 mi by road E of Mex. Hwy 200 to Minas de Zimapán) and Talpa de Allende, rare, one plant, with *Begonia* and *Prochnyanthes mexicana* atop large rock outcrop in pine forest, 20° 22' N, 105° 04' W, 1920 m (altimeter), 18 Aug 1993, *Cochrane et al. 13136* (IBUG, TEX, WIS, ZEA).

The closest relatives of *Castilleja albobarbata* are within a group of species identified as *Castilleja* subg. *Castilleja* by Holmgren (1976) and sect. *Castilleja* by Nesom (1992). These species are characterized by (1) a racemose inflorescence, (2) colored calyces but usually green floral bracts, (3) calyces with a deeply cut (anterior) abaxial cleft and a shallow (posterior) adaxial one, and (4) corollas with the galea equalling or longer than the tube. A key to most of the Mexican taxa with this character constellation (including "white-bearded *Castilleja* Iltis & Nesom ined." = *C. albobarbata*), as well as detailed discussion and distribution maps for many of them, were provided in Nesom (1992).

Within sect. *Castilleja*, *C. albobarbata* is most similar to *C. integrifolia*. This pair is distinguished among its relatives by long pedicels (10–20 mm long), a dense beard on the upper side of the galea, and loose, racemose inflorescences terminated by a cluster of colored bracts. The new species differs from *C. integrifolia* in its short, ascending-appressed (antrorsely oriented) stem hairs, compared to the cauline vestiture in *C. integrifolia* of slightly longer (mostly 0.2–0.4 mm long), deflexed (retrorsely oriented) and closely appressed hairs. The orientation of stem hairs is consistent within both species, although it may be variable in related species (e.g., *Castilleja tenuiflora* Benth.). The galea of *C. albobarbata* produces a beard similar in density and trichome length to that of *C. integrifolia*, but the beard of the new species is bright white and a striking recognition feature.

Castilleja integrifolia is a wide-ranging and variable species, distributed from the paramos of the Andes Mountains in Colombia and Venezuela, broadly through the mountainous regions of most of Central America and southern Mexico, and on northward in the Sierra Madre Oriental of northeastern Mexico as far as northern Nuevo León and Coahuila. A map of its distribution in Mexico is shown in Nesom (1992, Map 2). The type specimen was collected in Colombia (*Mutis 82*, holotype: LINN, fiche!). Within its broad range, *C. integrifolia* is fairly common in appropriate habitat and mostly consistent in its basic morphological features. Regional variants exist, however, and these are incompletely

understood. One taxon, described as *C. chiapensis* Brandegee, is based on plants from the mountains of central Chiapas, having a densely villous vestiture of golden-yellow hairs. A second form, apparently endemic to central Oaxaca and described as *C. longibracteata* Mart. & Gal., is distinguished by its broadly obovate, fimbriate-tipped apical bracts. Type material for another variant, *C. integrifolia* var. *alpigena* L. Williams from Guatemala, appears to be referable to *C. pectinata* Mart. & Gal. The range of *C. integrifolia* in Mexico most closely approaches that of *C. albobarbata* in central Guerrero and Edo. México, across a gap of about 450 kilometers. The morphological distinction between the two taxa is consistent but not great – recognition of *C. albobarbata* at specific rank emphasizes its wide geographic disjunction from *C. integrifolia*.

This taxonomic disposition is further supported by the discovery of *Castilleja albobarbata* at the far northwestern end of Sierra Cacoma, an extensive, two-parted, southeast-to-northwest oriented mountain range of the Sierra Madre del Sur that begins where Sierra de Manantlán ends at Puerto Los Mazos. This locality is about 33 kilometers southeast of Puerto Vallarta and extends the range of *C. albobarbata* more than 110 kilometers northwest of the area of the type locality at Cerro Las Capillas. It also suggests that other stations of this rare species may yet be found at high elevations in between, in that vast area of rough topography still undercollected despite many years of concerted botanical activity.

The type locality of *Castilleja albobarbata* is most remarkable floristically and ecologically (Vázquez-G. et al. 1995). Perched atop an enormous, sheer and windswept, south-facing cliff, this crest of the central section of Sierra de Manantlán forms the very edge of the Sierra Madre del Sur and reaches its highest elevation (2800–2860 meters) at Cerro Las Capillas. Below, one can see on any clear evening, far beyond the parallel ridges of ever-lower hills, the shimmering Pacific Ocean at Manzanillo, some 60 kilometers to the south. Be it due to the near continual roaring winds from off the Pacific coast or the high altitude, be it the dry crumbly sandstone conglomerate or evidence of frequent fires, the vegetation on the crest is one of an open, burnt-over pine-oak parkland (*Pinus hartwegii* Lindl. sensu lato, see comments below), the scattered trees understoried by ericaceous shrubs and tussock grass ("sacaton"), giving the appearance of a Mexican subalpine "sacatonal." The low, evergreen ericaceous scrub consists of *Pernettia prostrata* (Cav.) DC., *Vaccinium confertum* Kunth, *Comarostaphylos discolor* (Hook.) Diggs subsp. *manantlanensis* Diggs, and the remarkable diminutive *Arbutus occidentalis* McVaugh & Rosatti, the latter two here at their type locality. Amongst our scattered and rare *Castilleja* are small patches of an as yet undescribed *Alchemilla* (*A. manantlanensis* Iltis, nom. prov.) seen nowhere else, and of the robust grass tussocks of a giant *Agrostis* known apparently only from this one site. With fully 8 dm tall culms from a woody, rhizome-like base, and with many, crowded, long leaves, *A. novogaliciana*

McVaugh is unusual in other ways as well. The author himself (McVaugh 1983:42) noted that "it is quite unlike any other Mexican species of *Agrostis* and indeed may be out of place in that genus."

On the gentler, cooler, moister, north-facing slopes, a few hundred meters below the crest and less susceptible to fire, is a mixed conifer-deciduous cloud forest of *Abies religiosa* (Kunth) Schltdl. & Cham., *Pinus hartwegii*, *Cupressus lindleyi* Endl., and *Quercus* spp. In its dense understory another *Castilleja* grows in abundance, the yellow and red-flowered *C. macvaughii* N. Holmgren, a shrub to 1.5 or even 2 meters tall, strictly endemic to the high elevation cloud forests a few kilometers east and west of Cerro Las Capillas. *Castilleja macvaughii* shares its cool habitat with the recently described, more widely distributed but always local *Symplocos sousae* F. Almeda and other endemics such as *Ageratina manantlanensis* B.L. Turner. Other, more widespread *Castilleja* species, at slightly lower elevations, include *C. nervata* Eastw. and *C. pterocaulon* N. Holmgren.

Finally, even the pines at Cerro las Capillas present a taxonomic problem. "*Pinus hartwegii*" sensu lato (as noted above) is listed in Vázquez et al. (1995:106) as *P. durangensis* Martínez, according to the botanists R. Cuevas-G. and S. Carvajal-H. In the discussion, however, the local pine expert J. Pérez de la Rosa suggested it to be *P. martinezii* E. Larsen, while W.B. Critchfield identified these collections as an aberration of *P. hartwegii*. Considering the great local endemism at this locality, it may yet prove to be an undescribed local variant, and thus Critchfield correct.

The concentration of so many endemics on the slopes or at the very top of Sierra de Manantlán, some 40 species in all (Vázquez et al. 1995; Hernandez 1995:72–81), suggests that this mountain, like so many others in Mexico, acted not only as a "survivium" (refugium) of a once more extensive montane and subalpine flora during periods of glacial cooling and of its remnants in the present post-glacial warming but, in addition, because of its isolation, as an "Inselberg," an island of autochthonous speciation, even if now only a few hectares in extent.

Similarly, the Sierra Cacoma station for *Castilleja albobarbata* lies in the center of a hotbed of endemism, which though only 30 to 40 kilometers southeast to southwest of the vacation mecca of Puerto Vallarta, has until recently remained relatively uncollected. Its exploration has been facilitated by the now already deteriorating east-west gravel road that starts out (from Mexican Highway 200) 5 kilometers north of El Tuito, goes east for 52 kilometers to the *Castilleja* locality near the now abandoned Minas de Zimapán, and continues beyond for 47 kilometers to Talpa de Allende. This "brecha" Tuito-Talpa opened up since the 1960's vast, previously inaccessible, forested lands, from the subtropical northern end of Sierra El Tuito (500–1880 m) south to the higher Sierra El Cuale (1000–2300 m) north of the road, and finally to the grand, rug-

ged, isolated end of the Sierra Cacoma (with several peaks above 2600 m and one to 2740 m!). Most of the collecting evidently occurred next to the road, as with the single plant of *Castilleja*. Yet, with its rocky pine forest habitat continuing up the mountain slopes for another 1800 meters to equal the altitude of the type collection, one can predict that it may yet reveal a much larger population. And the cloud forests that probably crown the peaks also offer potentially rich scientific rewards. In any case, all along the Minas de Zimapán road, these pine to oak woods have yielded a cornucopia of rarities and recently described local endemics: *Quercus tuitensis* L.M. González and *Q. cualensis* L.M. González (González-V. 2003a, b), *Pinus jaliscana* Perez de la Rosa, *Muhlenbergia cualensis* Herrera & P. Peterson, and various novelties in the genera *Aechmea*, *Agarista*, *Aristida*, *Triniochloa*, *Pedilanthus*, *Stevia*, and *Wedelia*.

What the flora of the highest peaks may yet yield is a tantalizing question. These are, after all, extensions of Sierra de Manantlán and equivalent in altitude to that of Cerro Las Capillas (2740 vs. 2860 meters). Here is a real botanical challenge to any young botanist, for soon it may be too late. Not only are lumbering and cattle grazing expanding up the mountains to supply an ever growing Mexican population, but global warming, world-wide, is a fact botanists need to consider.

What indeed will be the fate of many of these high-altitude microcenters of biodiversity, the "Inselbergs" of evolution, these biogeographic survivia, in consequence of global warming? Surely many of these endemics and rarities would soon be pushed off their high mountain perches by a warmer climate and displaced by pine forests or even cloud forests advancing from below. But as for the large number of rarities at Las Capillas, the type locality of *Castilleja albobarbata*, their survival for the time being is assured by protection in the Core Zone of the Sierra de Manantlán Biosphere Reserve (Guzmán-M. and Iltis 1991; Halffter 1987; Vázquez et al. 1995).

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